



### Preventing repetitive stress injuries in agriculture

**E**rgonomics is the science of fitting the job to the worker, in the view of the U.S. Department of Labor's Occupational Safety and Health Administration (OSHA). Repetitive stress injuries (RPIs) result when the physical requirements of a job exceeds the physical capacity of the worker. Repeating the same motion throughout a workday, performing a particular task in an awkward position, using a great deal of force to perform a job, repeatedly lifting heavy objects or any combination of such functions increases the likelihood of repetitive stress injuries in workers.

Often RPIs can be prevented by simple and inexpensive changes in the workplace, such as adjusting the height of a work surface; varying tasks among workers and encouraging short rest breaks; reducing the size or weight of items workers must lift or providing lifting equipment to aid workers. The goal of the UC Agricultural Ergonomics Research Center (AERC) is to identify tasks that lead to RPIs and recommend ways to prevent such injuries.

AERC team member John A. Miles, professor in the UC Davis Department of Biological and Agricultural Engineering, presented a talk titled "Approaches to Improving the Ergonomics of Agricultural Stoop

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Wine grape harvest. Photo courtesy of AERC.

### Agricultural surveillance of respiratory disease

**S**tate-based health departments, which have the legal authority to require disease reporting and collect other health data, play a crucial role in public health surveillance. These agencies have access to a wide variety of public health data systems and play a critical role in surveillance of occupational diseases, injuries and hazards. To date no comprehensive, nationwide system of surveillance for occupational diseases, injuries and hazards exists. The recent NIOSH (National Institute for Occupational Safety and Health) Strategic Surveillance Plan recognizes that states

play a vital role in collecting data, and that state-based surveillance activities provide a foundation for federal surveillance systems.

As principal investigator of an ambitious Center-supported project to combine public health data from various California agencies, Robert J. Harrison, M.D., M.P.H., has established the Agricultural Surveillance of Respiratory Disease project. He intends it to serve as a model for creation and maintenance of an organized statewide agricultural respiratory disease surveillance system.

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On a national level a comprehensive occupational health surveillance program would give all states core capacity to conduct surveillance of occupational injuries, diseases and hazards. Such a resource will contribute to state and local prevention efforts, as well as amplify national data concerning magnitude, trend and distribution.

Harrison, who serves as chief of the Occupational Health Surveillance and Evaluation Program for the California Department of Health Services (CDHS), is a clinical professor of Medicine at the University of California, San Francisco. He is working with the University of California, Davis, toward:

- providing critically needed data on occupational disease;
- generating information necessary to evaluate conventional occupational injury data sources;
- actively linking surveillance findings with intervention efforts at the state and local level; and
- integrating occupational health into mainstream public health practice.

**OCCUPATIONAL-RELATED  
ASTHMA IN CALIFORNIA**

Since 1993 the CDHS has been collecting and analyzing surveillance data for occupational-related asthma and general respiratory disease in California. Funded under the NIOSH



SENSOR program, this project utilizes established reporting case definitions and case classification criteria to compile data useful to Worker's Compensation statistical analyses.

"All Doctor's First Reports (DFR) with any evidence of respiratory symptoms resulting from exposure to chemicals, dust or smoke are pulled for review by the project physician/principal investigator," says Harrison. "Once reviewed, we assign a diagnosis code to represent asthma, bronchitis, pneumonia, lower respiratory symptoms, upper respiratory symptoms or bronchospasm. Asthma cases are entered and processed in a different database system from the remaining general respiratory cases."

Since October 2000, the Western Center for Agricultural Health and Safety has provided funds to aid Harrison and his colleagues in data retrieval from DFRs and the Workers' Compensation Information System (WCIS), as well as coding the records and entering the

information to the dataset. "Our overall hypothesis is that through such descriptive data, we can identify useful areas for intervention that can inform the overall research goals of the UC Davis agricultural research center," explains Harrison. "For

instance, our preliminary data already suggests that laborers in agricultural crop production comprise the major group in terms of magnitude of respiratory disease. With a large data set, we can refine our analyses with greater attention to such risk factors as crop type, pesticide usage and work process."

For more information on the Agricultural Surveillance of Respiratory Diseases project, Harrison can be reached by e-mail at rharris@itsa.ucsf.edu, or by phone at (510) 622 4404.



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## Agricultural injury economic implications are significantly underestimated

**T**he costs of agricultural injuries in the United States are about the same as the costs of hepatitis C, which has received a significant amount of media attention in recent years. But agricultural injuries don't get nearly as much research funding or public attention.

A Center-funded study, led by J. Paul Leigh, Ph.D., professor of Epidemiology and Preventive Medicine, reveals that agricultural occupational injuries are an "underappreciated contributor to the overall national burden of health and medical costs."

Agricultural injuries cost the 1992 economy an estimated \$4.57 billion, of which direct costs total \$1.66 billion, with indirect costs of \$2.93 billion. Direct costs include fees charged for hospitals, treatment by doctors, medications, medical and indemnity insurance. Indirect costs encompass lost wages, lost fringe benefits, lost productivity at home (e.g., in rearing children, cooking meals, cleaning), retraining and recruiting.

A contemporary analysis of the problem was presented in an article titled "Costs of Occupational Injuries in Agriculture," written by J. Paul Leigh, Stephen A. McCurdy, M.D., M.P.H., and Marc B. Schenker, M.D., M.P.H. The article appeared in the May-June 2001 issue of *Public Health Reports*.

"The biggest obstacle we have is that the data are difficult to come by," says Leigh. "If you want to estimate the number of injuries among farm workers or farmers across the United States it's very difficult to find high-quality data. We found the most comprehensive cost data applied to 1992."

Using data from the Bureau of

Labor Statistics' Annual Survey and Census of Fatal Occupational Injuries, as well as NIOSH's National Traumatic Occupational Fatality Survey, Leigh and his colleagues formulated an injury

care or lost wages," he says. "Evidence in the legal literature suggests that the cost for pain and suffering may be about three times the cost of medical care or lost wages."



Old tractors such as this with no rollover protective structure (ROPS) were the source of thousands of fatal and disabling injuries until NIOSH issued warnings during the early 90s.

cost estimate based on 841 deaths and 512,539 non-fatal injuries. Of those non-fatal injuries, 281,816 were non-disabling and 230,643 were disabling (defined as losing a full day or more of work).

"A big problem associated with the Annual Survey information is that the data come from farm managers and owners, not employee groups or unions," says Leigh. "So we took into consideration deficiencies in these data, and made adjustments to our estimates."

Leigh believes the \$4.57 billion cost estimate is conservative. In addition to underreported injuries, the cost-of-injuries estimate doesn't take into consideration the additional costs of caregivers for people who are severely injured or the cost of pain and suffering. "Of course, that is very controversial, but if you look at jury awards, pain and suffering is a much larger amount than the actual cost of medical

In comparing the cost of agricultural injuries to the cost of human disease, Leigh discovered that a 1997 study of the cost of hepatitis C was estimated at \$5.46 billion. Since medical prices have risen at an annual rate of about 4.5 percent, and wage inflation is around 2.7 percent, the agricultural injuries estimate in 1997 would be \$5.4 billion—par with those of hepatitis C.

"Our injury estimate is also larger than the costs of job-related circulatory disease (\$3.5 billion) and chronic obstructive pulmonary disease (\$3.6 billion) in 1992," says Leigh. "So what are you likely to see in the newspaper, or on TV? Where do the research dollars go? Agricultural injuries don't get their fair share."

For more information, J. Paul Leigh can be reached by e-mail at [jpleigh@epm.ucdavis.edu](mailto:jpleigh@epm.ucdavis.edu), or by phone at (530) 754-8605.



**(Ergonomics** *from page 1*)

Labor Jobs” during a noon seminar in May sponsored by the Western Center for Agricultural Health and Safety. Miles and his colleagues with AERC have examined a variety of agricultural operations involving many tasks that lead to RPIs. “We talk about stoop labor in a generic sort of way,” says Miles, “but it isn’t until we look at the tasks that we can decide if we can do anything about them. I’m convinced that the solutions are very specific to the jobs performed.”

For years Miles and his research team have been investigating the ergonomics of a host of agricultural jobs, but this particular presentation covered the tasks of cutting cilantro, picking strawberries, nursery work and hoeing cotton. Each job has its own set of challenges—physical and sociological. After interviewing workers in a field hoeing between rows of cotton, investigators discovered unexpected injuries, mainly to the ankles and knees. “The dirt clods in the soil were the main reason for their problems—these people were walking on a crummy surface,” says Miles. “There’s an easy solution for this—management could pull a sled behind a cultivator and provide a reasonably good surface for the workers to walk on.”

During a weeding operation, investigators observed workers lifting bags of weeds onto an old cotton wagon. The wagon was too high and weed bags too heavy for women to lift. “So, instead of doing something to get the wagon height down, they’d have the men lift the bags,” said Miles. Investigators cited an obvious solution—to lower the wagon.

But some solutions are not so easy, especially when cultural



A smaller picking tub (above, right) reduced the weight from 57 lbs. to 46 lbs.

barriers enter into the picture. In an attempt to solve the problem of workers spending hours of time down on their knees, engineers developed a device in which workers could perform their job in the prone position. “We were working with Eastern Indian women, and discovered it’s socially unacceptable for them to be lying down when men are in the area,” said Miles. “So in that particular case, the best we could do was to let them choose which knee pads they preferred to wear.”

During a project supported by NIOSH to reduce back injuries in winegrape harvest workers, a research team with AERC found that using smaller picking tubs

significantly reduced risk for back injury in workers in Napa and Sonoma county vineyards. Harvest work involves stooping, gripping, lifting, carrying and dumping up to 20 times per hour. Workers now fill smaller tubs, which hold 46 pounds (compared to 57 pounds for the large tub) in less time, which means the lifting frequency is slightly greater. Investigators discovered a slight decrease in energy demand when using the smaller tubs due to their lighter weight, and workers were less tired throughout the day.

Intervention must be cost-effective; however, it’s difficult

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## More ergonomics projects

This summer Miles and the AERC team are busy with a variety of projects, including:

- evaluating the ergonomics of cilantro harvesting using conventional techniques as compared to harvesting with a small Italian machine;
- measuring the benefits of using a new type of container for picking strawberries;
- designing and testing new safer, more efficient methods of mushroom harvesting;
- perfecting the design of budding carts to improve the working conditions for people who are budding and grafting in commercial tree nurseries; and
- conducting a large field trial evaluating a wine grape handling machine that allows pickers to place the grapes into containers but eliminates need for them to lift and carry the grapes to a gondola.

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to determine costs of an injury. "They've eliminated the nasty job of hand-loading table grapes onto trucks, thus eliminating back injuries of workers," says Miles. "They think they're getting about a 15 percent productivity improvement, which helps pay the bills for harvest."

All of the projects that resulted in successful solutions had the full support of management and workers. "I look for situations where we can form a partnership to address a problem," says Miles. "I think many of our bad labor situations are the result of a long history of people doing what grandpa did without challenging what it was that grandpa did." Miles and his colleagues are hoping to make farm labor far more productive and far less hazardous than the risky practices to which grandpa was subjected.

If you'd like more information about UC Agricultural Ergonomics Center projects, call (530) 754-8817, or visit <http://ag-ergo.ucdavis.edu> on the Web

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### NIOSH booklet offers low-tech solutions

The National Institute for Occupational Safety and Health has published a free 46-page booklet that contains a number of inexpensive, low-tech solutions for common agricultural tasks that will both reduce strains and sprains as well as improve worker performance. Call (800) 356-4674, or e-mail [pubstaf@cdc.gov](mailto:pubstaf@cdc.gov) and ask for "Simple Solutions: Ergonomics for Farm Workers," publication No. 2001-111.

## Small Farm Center offers new online resource library

**F**armers, researchers and educators can now tap into hundreds of articles related to production agriculture thanks to the new UC Small Farm Center Online Resource Library, located at [www.sfc.ucdavis.edu/library](http://www.sfc.ucdavis.edu/library).

This continuously updated online resource contains more than 1,000 database entries, which consist of article summaries and abstracts on a multitude of topics ranging from production and marketing to farm management and equipment. The entries are comprehensive and geared to small-farm operations.

"The Small Farm Center has a number of groundbreaking publications on specialty crops, farm management, pesticide safety and the like," says

Desmond Jolly, director of the UC Davis-based UC Small Farm Center. "This new Online Resource Library increases our ability to extend our information resources to our clientele."

After reading summaries and abstracts posted in the library, users can make online requests for copies of the complete articles or publications. Articles will be faxed or mailed out upon request. Currently the Center doesn't charge for copying, mailing or faxing the articles.

The new online library is part of the educational program of the UC Small Farm Center, which is devoted to enhancing the viability of small- to moderate-scale agricultural producers.



## UC Davis agricultural research funding tops nation

**U**C Davis leads all other U.S. universities in external research funding in the agricultural sciences, according to the National Science Foundation (NSF). In the fiscal year 2000, UC Davis received \$128.1 million in contracts and extramural grants for agricultural research—a 22 percent increase from the year before.

The second highest total was the University of Georgia's \$87.4 million, followed by the University of Florida at \$87.3 million. Grant dollars go to qualified researchers for specific areas of study and cannot be used for other purposes.

"We are excited to lead the country in this important yardstick of research abilities,"

said Neal Van Alfen, dean of the College of Agricultural and Environmental Sciences. "It is reflective of the creative inquiry of our faculty, academic staff and students that they are able to attract this level of research funding. Research grants are highly competitive."

In 2000, UC Davis also received \$34,870 in federal funds, a 22 percent increase from the 1999 figure. The figures were made available in the NSF's publication, "Academic Research and Development: Expenditures: Fiscal Year 2000." The report was published in December 2001. The UC Davis ranking is at <http://www.nsf.gov/sbe/srs/srs02402/pdf/b60.pdf>.



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## NIOSH adds two new ag centers

**T**wo new centers located in North Carolina and Ohio bring the total to 10 agricultural safety and health centers funded by the National Institute for Safety and Health (NIOSH). The Southeastern Regional Center for Agromedicine, based at East Carolina University in Greenville, serves Virginia, North Carolina, South Carolina, Georgia, Alabama, Mississippi, Florida and Puerto Rico. The states of the Southeastern region and Puerto Rico face many common agromedicine issues related to climate, crops, the timber industry, commercial fishing, migrant workers and poverty in rural areas. The center's director, Susan S. Gustke, M.D., may be reached by phone at (252) 744-1000, or by e-mail at

[gustkes@mail.ecu.edu](mailto:gustkes@mail.ecu.edu).

The Ohio Regional Center for Agricultural Disease and Injury Research, Education and Prevention is located at Ohio State University in Columbus. The center's development is a collaborative effort between individuals from the College of Food, Agricultural and Environmental Sciences and the College of Medicine, School of Public Health. The center serves agricultural employers, employees and their families throughout Illinois, Indiana, Kentucky, Michigan, Ohio, Pennsylvania, Wisconsin and West Virginia. Director Thomas L. Bean, Ed.D., can be reached by phone at (614) 292-9455, or e-mail: [bean.3@osu.edu](mailto:bean.3@osu.edu).



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